

## Combustion

**QUESTION:** Write balanced equations for the complete and incomplete complete combustion of the following molecules

organic molecule	equation for complete combustion	equation for <u>in</u> complete combustion
methanol		
butane		
pentane		
ethanol		
propane		

### Additional questions on combustion

1) Both butane and methanol can be used as fuels. A sample of butane burns in air with a yellow flame, while a sample of methanol burns in air with an almost invisible flame. Compare and contrast the combustion of these two fuels.

**2)** Combustion of fuels can have negative effects on both human health and the environment. Identify and explain TWO negative effects of the combustion of fuels on both human health and the environment. Your answer should include:

- ONE negative effect on human health, and
- ONE negative effect on the environment.

**3)** Propane and methanol are carbon compounds that are used as fuels. When propane is burning with an orange flame it produces soot. When methanol is burning with an almost invisible flame it produces no soot.

Discuss the effect on the environment of burning propane and methanol as described above. In your answer, you should:

- explain how the combustion of propane and the combustion of methanol differ
- identify which combustion reaction has the greater negative effect on the environment and justify your answer.

**4)** Discuss TWO impacts (positive or negative) that the products of the complete combustion of methanol would have on the environment.

**5)** Pentane and ethanol are two colourless organic liquids that can be used as fuels. Discuss the similarities and differences for the combustion of both fuels. Include in your answer:

- the observations made when each fuel is burned
- the impact of combustion on the environment for each fuel.

**6)** Propane and ethanol are organic compounds used as fuel. Propane burns with an orange flame and some soot forms. Ethanol burns with an almost invisible flame with no soot forming. By considering the products of these reactions, predict and justify which fuel will have the larger impact on people. Include examples of how people would be affected, and an appropriate balanced equation for each fuel.

**7)** State TWO reasons why organic compounds such as butane are used as fuels. Explain the difference between complete and incomplete combustion of fuels.

8) If insufficient oxygen is available in a car engine, incomplete combustion can occur. Describe incomplete combustion and discuss its impact on human health.

	<b>Ethanol</b>	<b>Propane</b>
Source other than crude oil and method of production.	Fermentation of plant sugars in sugar beet.	Removing other compounds from natural gas.
Energy given out by burning 100 g of fuel.	2958 kJ	5027 kJ
State at 25°C	liquid	gas
Storage in motor vehicles.	As a liquid in 'petrol' tank.	As a liquid in heavy, pressurised cylinder.
Mass of carbon dioxide produced from 100 g of fuel.	191 g	299 g
Observation during burning in air.	Burns with an almost invisible flame. No soot remains.	Burns with a yellow flame. Some soot forms.

Compare ethanol and propane in terms of:

- the impact of the combustion of each fuel on people and the global environment
- the energy produced by the burning of each fuel
- safety considerations in handling and storing the fuels.